MACROECONOMIC MODELS USED IN THE STRUCTURAL ANALYSIS OF THE GROSS DOMESTIC PRODUCT

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Abstract

This paper describes a use case for macro economical models, the objective being the structural analysis of the Gross Domestic Product. The authors offer a snapshot on GDP evolution, the econometric models proposed for analysis are designed with the help of EViews software. Its performances are determined through the optics of the statistical tests.

Key words: *estimation, regression, gross domestic product, factor, evolution*

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Starting from a data set related to the evolution of GDP and the turnover of internal trade in Romania during the last fourteen years, the turnover being drilled-down on retail trade turnover of mainly public-owned companies and mainly private-owned companies, we propose a multiple regression model that will allow the analysis of the links between these indicators.

In this respect, we shall consider as result variable the value of GDP and as factorial values the three measures presented, total retail turnover and turnover from retail trade depending on ownership.

GDP and the turnover of retail trade in the period 1997 - 2010Analyzed variables

Year	GDP in million lei	Total turnover from retail trade in million lei (CAT)	Turnover from retail trade in companies mainly owned by the state in million lei (CAS)	Turnover from retail trade in companies mainly owned by the private sector in million lei (CAP)
1997	25 529,8	6637,7	2,0	6635,7
1998	37 055,1	9634,3	3,0	9631,3
1999	55 191,4	15067,2	4,8	15062,4
2000	80 984,1	22756,5	7,3	22749,2
2001	117 945,8	32553,0	10,4	32542,6
2002	152 017,0	41044,6	13,0	41031,6
2003	197 427,6	56266,8	17,4	56249,4
2004	247 368,0	71732,7	23,7	71709,0
2005	288 954,6	83796,8	25,2	83770,8
2006	344 650,6	96502,2	32,0	96470,2
2007	416 006,8	116481,9	38,0	116443,0
2008	514 700,0	111853,4	39,0	111814,4
2009	501 139,4	108515,0	30,0	108485,0
2010	522 561,1	114962,0	29,0	114933,0

The econometric description of the link between the three variables can be made with the help of four models:

- **A single-factor model** able to explain the variation of GDP based on total turnover from retail trade.

-**A single-factor model** able to explain the variation of GDP based on the modification of turnover in retail trade in public owned-companies.

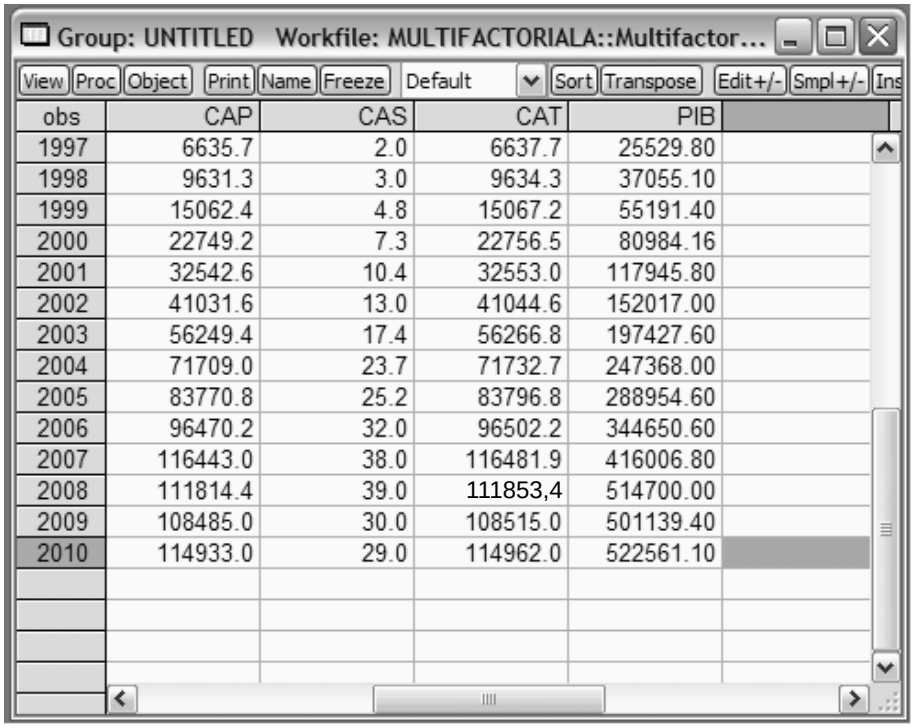
-**A single-factor model** which would explain the variation of GDP based on the modification of turnover in retail trade in private owned-companies.

-**A multi-factor model** that explains the evolution of the GDP depending on the three indicators.

Based on this brief review, we can ascertain that the regression model to be used is linear.

To facilitate the determination of the **multiple regression model**, we have used the software package EViews 5.1. the four variables previously defined were opened as a group.

EViews variable group


Group: UNTITLED Workfile: MULTIFACTORIALA::Multifactor...

View | Proc | Object | Print | Name | Freeze | Default | Sort | Transpose | Edit+/- | Smpl+/- | Ins

obs	CAP	CAS	CAT	PIB
1997	6635.7	2.0	6637.7	25529.80
1998	9631.3	3.0	9634.3	37055.10
1999	15062.4	4.8	15067.2	55191.40
2000	22749.2	7.3	22756.5	80984.16
2001	32542.6	10.4	32553.0	117945.80
2002	41031.6	13.0	41044.6	152017.00
2003	56249.4	17.4	56266.8	197427.60
2004	71709.0	23.7	71732.7	247368.00
2005	83770.8	25.2	83796.8	288954.60
2006	96470.2	32.0	96502.2	344650.60
2007	116443.0	38.0	116481.9	416006.80
2008	111814.4	39.0	111853,4	514700.00
2009	108485.0	30.0	108515.0	501139.40
2010	114933.0	29.0	114962.0	522561.10

Inside this group, by using the Quick – Estimate Equation, an equation is defined, having as result variable the GDP, and as factorial variable the turnover in retail ca trade, on overall and on ownership form.

Also, in the regression model, a free term was introduced, designated as c, this is to reflect the influence of the terms not taken into consideration when the model was built.

The estimation of the parameters for the considered model, in the EViews software, the least squares method was used.

The results achieved upon the application of the considered model and determined in Eviews are:

EViews results

Dependent Variable: PIB				
Method: Least Squares				
Date: 09/11/12 Time: 05:58				
Sample: 1997 2010				
Included observations: 14				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4065.012	9339.779	-0.435236	0.6726
CAT	24.41714	3.829814	6.375542	0.0001
CAP	-16.01336	3.532282	-4.533433	0.0011
CAS	-14779.64	2380.713	-6.208073	0.0001
R-squared	0.992343	Mean dependent var		250109.4
Adjusted R-squared	0.990046	S.D. dependent var		183454.0
S.E. of regression	18302.91	Akaike info criterion		22.70246
Sum squared resid	3.35E+09	Schwarz criterion		22.88505
Log likelihood	-154.9173	F-statistic		432.0142
Durbin-Watson stat	2.379373	Prob(F-statistic)		0.000000

The multiple regression model thus determined can be written as an equation:

PIB = -4065,012+ 24,41714 CAT – 16,01336 CAP – 14779,64 CAS

GDP recorded in 2010 a value of 522561.1 million lei, reaching 578551.9 million lei in 2011, and 109468.8 million lei in the first quarter of 2012.

The evolution of GDP in 2012, in the first semester, was slightly increasing, in the context in which on internal and international plan intern the crisis further affected the economic development.

During the period 2001-2008, GDP evolution was realized in waves, recording positive evolutions. Since 2009, under the effect of the economic-financial crisis, the decrease of the economic growth was triggered.

In 2011, as in the six months of 2012, the GDP has been achieved on the account of the activity carried out in the frame of the main branches of the national economy. Also, in 2011 the contribution of the agriculture, forestry and fish breeding was positive, 11.3%.

In 2012, on the first six months, the same trends persisted, with the mention that agriculture marked a serious recoil, as in can compromise at the end of the year the results measured through the evolution of GDP.

The activities carried out by services, industry, constructions and the net taxes on product, together, brought in a decisive contribution to the GDP decrease, which means a negative feature for the Romanian economy which failed to cope with the devastating effects of the crisis.

From the point of view of the "utilizations" in the GDP forming during the year 2011, it has been achieved by the contribution of the stocks variation, the net export, the gross forming of fixed capital, the final collective consumption of the public administration, the final individual consumption of the households.

The stocks variations recorded a lower contribution, while the net export, namely the difference between exports and imports, recorded a negative effect, counting for -4.8%.

From the point of view of the utilizations, the GDP formation has been achieved by the contribution of the following factors: gross forming of the fixed capital, final individual consumption of households with a decrease of -1.8%.

The individual consumption of households and the collective consumption of the public administration, together, have been reduced. A more marked decrease, has been recorded by the net export. Another negative effect has been recorded by the rhythm of increasing of the gross forming of fixed capital, respectively – 15.2%.

The GDP evolution during 2011 follows line of going over the "process" of the marked recession. During the first six months of the year 2011, the "un-accounted" negative effects of the year 2010 have been taken over and then continued with a slight increase, maintained in 2012.

Thus, the GDP decreased by – 1.3% as comparatively with 2009; all the branches recorded negative contributions, which implies the entrance into a macroeconomic managerial mess; the structure by branches and utilizations has been negative. In 2011, GDP grew by 2,5% as against 2010 and follows an oscillatory course in 2012.

When analyzing the quarterly evolution of the seasonally adjusted GDP during the year 2010 comparatively with the corresponding quarter of the previous year, it can be stated out that the biggest decrease has been recorded during the II quarter while the smallest one occurred during the fourth quarter. The same positive rhythm was also observed in 2011. During Quarter IV, 2011 and Quarter I, 2012, GDP decreases were recorded again.

In connection with the other European Union member countries, Romania recorded for the IV quarter 2010 as against the previous quarter, an economic decrease while a significant number of countries have recorded increases (Belgium, Denmark, France, Lithuania, Austria, Poland, Slovenia,

Great Britain), or recorded decreases bellow 0.5%. Meantime, the overall GDP of the EU increased by 0.1%.

Significant contributions to the negative evolution of the GDP during 2010 and 2011 comparatively with 2009 are given by the constructions, which recorded a decrease as well as by the section trade, cars and households appliances repair, hotels and restaurants, transports and telecommunications recording a decrease.

For the period 2009-2012, for which there are provisional data, the private sector contributed with 72.4%-75.4% to the GDP forming. The weight of the private sector, still low, has been generated mainly by the gross added value in the agriculture.

In 2010-2012, for which we are actually performing a complete analysis, we find that the weight of the private sector in the gross added value increased as for the constructions field.

What is really important is the fact that the weight of the private sector in the achievement of the gross added value by branches of the national economy and, eventually, to the GDP forming, kept on maintaining at a high level.

In the years 2001 - 2012, the private sector share in GDP recorded developments at 67.7% to 75.4% in 2012 (estimates). In 2001, the private sector share was 68.0%.

Conclusions

As it can be observed, the use of the multiple regression model confirms the idea that the value of the turnover in retail trade significantly influences the evolution of GDP. It can be seen that, in this case, the GDP growth induced by the increase with one million lei of the total turnover in retail trade is approximately 24.4 million lei for each unit modification of the factorial variable. It can be also retained a decrease of GDP by 16.01 million lei for each one million lei turnover in retail trade for private-owned enterprises (CAP). As for the turnover in retail trade of public owned companies (CAS) results indicate a decrease of GDP by 14779.64 million lei for each increase of 1 million lei of the turnover.

It must be stated however that in the model considered, the influence of the free term, as image of factors that have not been included in model, is significant. Therefore, the factors not taken into when the econometric model was built determine a significant decrease of GDP value.

From the viewpoint of statistical tests that verify the correctitude of the econometric model, it can be seen that the values of the tests R and R^2 are above 99% (R2 = 99,23%, and R^2 adjusted = 99,00%).

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